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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/826,301

04/19/2004

Masahiko Hirose

Q81022

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65565 7590 09/10/2009  
SUGHRUE-265550  
2100 PENNSYLVANIA AVE. NW  
WASHINGTON, DC 20037-3213

EXAMINER

MENON, KRISHNAN S

ART UNIT

PAPER NUMBER

1797

MAIL DATE

DELIVERY MODE

09/10/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/826,301	<b>Applicant(s)</b> HIROSE ET AL.	
	<b>Examiner</b> Krishnan S. Menon	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,5 and 17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,5 and 17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

Claims 1,2,5 and 17 are pending as amended 8/3/09

### ***Claim Rejections - 35 USC § 102 and/ or 103***

#### Interpretation of Claim 1:

Claim 1 recites a process for producing a composite semipermeable membrane by forming a polyamide thin film on the surface of a porous supporting film by reacting a polyfunctional amine ingredient and a polyfunctional acid ingredient, with the conditions that the amine ingredient is either aliphatic or aromatic, and that the reactions take place in the presence of an alkali metal hydroxide and an organic acid; the alkali/acid ratio ranging from 1.2/1 to 0.9/1. Amendment of 6/16/08 added the temperature limitation. Amendment added on 1/27/09 adds the limitation that the organic acid contains sulfo group. Amendment of 8/3/09 added the pH range 5-11.

The supporting disclosure for the alkali/acid ratio is found in paragraph 12 of the Pre-Grant Publication, wherein it is also disclosed that the pH of the solution is in the range 5-11, that when Alkali is greater than 1.2, pH would be too high and the membrane would lose flux, and that when alkali is less than 0.9, pH would be too low and the membrane would lose salt-rejection ability. Thus it is clear from the applicant's disclosure that the addition of the alkali metal hydroxide and the organic acid is to adjust the pH of the solution within the range 5-11.

1. Claims 1,2,5 and 17 are rejected under 35 USC 103(a) as being unpatentable over Agarwal (US 6,833,073; Its Pre-Grant Publication: 2003/0066796 has a 102(a) date)

or JP 2000117076 and further in view of Hirose or Tomaschke as applied below in paragraphs 2 and 3.

Agarwal teaches a process for making a semipermeable membrane over polysulfone porous film by interfacial polymerization of a polyfunctional amine such as piperazine or polyphenylene diamine in a aqueous solution containing propionic acid (an organic acid) and sodium hydroxide, with a polyfunctional acid halide solution in an organic phase. (See column 3, lines 7-49)

The purpose of adding sodium hydroxide is for adjusting the pH. However, the reference does not specify the pH range. Instead, it teaches that sodium propionate could be added in place of propionic acid and sodium hydroxide. Since sodium propionate is obtained by reacting one equivalent of sodium hydroxide and one equivalent of propionic acid, the reference inherently teaches the ratio of sodium hydroxide to propionic acid as 1:1, which falls in the middle of the claimed range. The result of adding propionic acid and sodium hydroxide in to the amine solution is inherently the same as adding sodium propionate. The pH of the solution also would be inherently within the range claimed, because the ratio of alkali to acid is in the range.

Agarwal does not specify a temperature. Therefore, one of ordinary skill in the art would look for an appropriate temperature for adopting into the process of Agarwal in the analogous literature to determine an appropriate temperature; both Tomaschke and Hirose teach temperature above 100C.

The JP reference also teaches a process of making a polyamide membrane by poly-condensation of a poly acid and a poly amine in presence of a carboxylic acid.

Regarding the organic acid containing a sulfo group, the organic is described in applicant's specification as "preferably contains a sulfo group and/or a carboxyl group" [Paragraph 0010 of the application publication]. This disclosure does not provide any criticality for the sulfo group as compared to the carboxyl group. The only criticality appears to be the pH, which can be adjusted by an organic acid, whether having sulfo group or carboxyl group. Paragraph 0024 discloses the organic acid as "not particularly limited as long as it is a compound which forms a salt with the alkali metal hydroxide". Paragraph 0024 includes propionic acid as well as several other organic acids as equivalents. Use of sulfonic acids is also well known as taught by Hirose and Tomasche.

2. Claims 1,2,5 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO99/01208 (US equivalent to Hirose, US 6,723,422 is used for the rejection).

Hirose teaches a method of making a polyamide membrane over a porous support film by interfacial polymerization of a polyfunctional amine and a polyfunctional acid chloride in presence of an organic acid and sodium hydroxide. Solution 'A' contains polyacrylic acid or other organic acids – column 4, lines 29-42 – to facilitate formation of the membrane or to improve membrane properties. Solution A also contains salts of organic acids – column 4, lines 37-42. Solution A contains surfactants – the sulfonates and sulfates of sodium, which are salts of sodium hydroxide and the

corresponding organic acids in the ratio 1:1 – column 4, lines 43-47. The reference also teaches in column 5, lines 33-37:

“Furthermore, for accelerating the polycondensation reaction at the interface, it is effective to use sodium hydroxide or sodium tertiary phosphate in the solution A, which is capable of removing a hydrogen halide formed during the interfacial reaction or to use an acylation catalyst.” [underline added]

Thus the reference teaches that the porous membrane is contacted with solution A, which has the amine with two reactive amino groups, an organic acid such as polyacrylic acid, and sodium hydroxide, in addition to other ingredients like surfactants. The porous membrane loaded with all these stuff is then contacted with the solutions B and C, which are the acid chloride solution in organic solvents. Thus the reaction takes place as is expected in the claims. In addition, the reference teaches further contacting the porous support formed with the layer with sodium hydroxide in column 4, lines 13-21, which when combined with the quotation from column 5 above, would show that the reaction proceeds further to completion when contacted with sodium hydroxide, because it removes the hydrogen halide formed, thereby accelerating the reaction. Also, example 1 describes camphor sulfonic acid (an organic acid) as the acid ingredient in solution A.

Thus the reference teaches contacting the porous membrane with all the ingredients as recited. ***All the ingredients can be present at the same time in the solution.*** Since the reference teaches pH which significantly overlaps the range claimed, the ratio of the sodium hydroxide to organic acid also would be inherently in the same range, or overlapping the range as claimed. It would also be obvious to one

of ordinary skill in the art at the time of invention to have the alkali/organic acid ratio in the range to maintain the pH at the desired range.

Considering applicant's disclosure, applicant adds an organic acid and sodium hydroxide in the polyfunctional amine solution. However, looking at applicant's working examples, five out of six examples show the pH of the polyamine solution as either neutral or in the acidic range. Thus there is **no free** sodium hydroxide in any of these solutions. The reference examples or the comparative examples show higher pH's but the membrane performance from the resulting membranes is not as good. Therefore, there appears no particular significance of having sodium hydroxide as an ingredient in the reaction in the working examples, except that it is added to control the pH of the solution. On the other hand, applicant's disclosure (paragraph 12 of the Pre-Grant Publication) states that the addition of the organic acid and alkali metal hydroxide is for adjusting pH within a desired range.

Temperature is 120C. The pH is 8-13 when NaOH is used on the polysulfone porous membrane, which overlaps the range.

Regarding the "sulfo group" in the organic acid, see the rejection paragraph 1 above.

3. Claims 1,2,5 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, under 35 USC 103(a) as being obvious over, Tomaschke (US 6,464,873).

Tomaschke teaches a method of making a polyamide membrane by interfacial polymerization (see example 1) of a polyamine (bipiperidine) and a polyacid chloride (trimesoyl chloride) in the presence of camphor sulfonic acid (formed by hydrolysis of TEACSA in water: column 7, lines 35-45: strong acids such as sulfonic acids react completely with water to form hydronium ion - the acid) and sodium hydroxide on polysulfone porous membrane. Temperature is above 100C. Regarding the pH adjustment, see column 8 lines 12-46. Normality ratio of the organic acid to sodium hydroxide would be inherently in the range claimed because the reference teaches the resultant pH falls in the same range claimed.

Tomaschke teaches hydrolyzing the TEACSA with sodium hydroxide, which means the solution would have camphor sulfonic acid and sodium hydroxide (all together) in solution during the process. Thus the claims are anticipated, or is at least obvious to one of ordinary skill in the art.

Regarding the "sulfo group" in the organic acid, see the rejection paragraph 1 above. TEASCA and camphor sulfonic acid does have sulfo group.

### ***Response to Arguments***

Arguments presented are not persuasive.

Arguments about propionic acid have no basis; they are simply attorney arguments and do not have any evidentiary value, and contradicts applicant's disclosure. Argument that membrane made without sulfonic acid and sodium hydroxide



have poor IPA rejection and flux is unsupported by the data of TABLE in applicant's specification. Moreover, this entire argument is against the disclosure at paragraph 0024 of the specification.

Regarding the addition of sodium hydroxide in Hirose, the solution contains organic sulfonates of sodium, which is a reaction product of sulfonic acids and sodium hydroxide, the result obtained when adding sulfonic acids and sodium hydroxide in applicant's reaction.

Regarding Tomasche, argument that bipiperidine is not aliphatic or aromatic is not persuasive. Tomasche's pH range overlaps that of the applicant. Regarding claim 17, adjusting the pH would be only a matter of routine optimization, basis for which is obtainable from the references cited in this office action. Moreover, 'about 10' would read on 9.1

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krishnan S. Menon whose telephone number is 571-272-1143. The examiner can normally be reached on 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on 571-272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Krishnan S Menon/  
Primary Examiner, Art Unit 1797